ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

Douglas A. Ducey
Governor

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Director

via e-mail

April 2, 2020
FPU20-228

Ms. Catherine Jerrard
AFCEC/CIBW
706 Hangar Road
Rome, NY 13441

RE: WAFB – ADEQ Comments – *Draft, Soil Vapor Extraction System And Pilot Study, 2018 Annual Performance Report, Former Liquid Fuels Storage Area, Site ST012, Former Williams Air Force Base, Mesa, Arizona;* prepared for Air Force Civil Engineer Center [AFCEC/CIBW], Lackland AFB, TX; prepared by Amec [Foster Wheeler] Environment & Infrastructure, Inc. (Amec), Phoenix, AZ; document dated December 17, 2019.

Dear Ms. Jerrard:

Arizona Department of Environmental Quality (ADEQ) Federal Projects Unit (FPU) and ADEQ contractor UXO Pro, Inc. reviewed the above referenced document. ADEQ's comments are provided below.

General Comments

1. ADEQ appreciates the information breadth and depth presented within the 2018 annual performance report. ADEQ understands that the December 2019-dated draft document recounts generally 2018 calendar year activities. ADEQ notes this draft-version report was released nearly 12 months after the reporting period ended. The ability to comprehend actions and relate concerns is hindered by reports released nearly a year after the action reporting period. Regulatory concurrence may be limited due to the inability to receive timely clarification and implement actions.
2. ADEQ believes Appendix O could be better presented as a standalone document. ADEQ recommends providing "Appendix O" as a separate report for the Administrative Record. Comments are provided for *Draft Annual 2018 Groundwater Monitoring Report, Former Liquid Fuels Storage Area, Site ST012, Former Williams Air Force Base, Mesa, Arizona;* prepared for AFCEC/CIBW, Lackland AFB, TX; prepared by Amec, Phoenix, AZ; document dated XX June, 2019 [*sic*] [*OR December 2019...ADEQ is unable to establish a report date due to multiple dates being attached to the title page and the page footers*].
3. ADEQ suggests the document include text discussing evaluations and investigations regarding contaminant vapor intrusion into nearby buildings.
4. ADEQ believes elaboration and greater discussion will benefit the data presentation in Sections 3.1.2, 3.1.3, and 3.1.4.

5. The estimated masses of benzene and TPH during the reporting period appear to be low. These masses were calculated with the more frequently collected air stripper effluent gas stream entering the thermal oxidizer. These mass estimates are roughly three times higher. This discrepancy should be addressed.

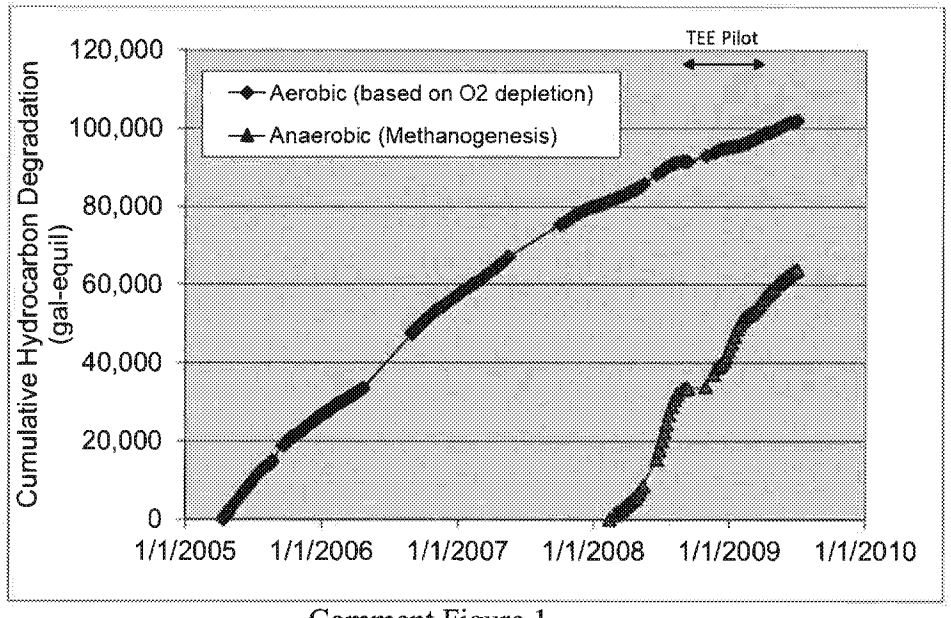
Specific Comments:

1 Bound cover. Please clarify the report preparer. The bound copy cover lists the preparer as *Amec Environment & Infrastructure, Inc.* However, the inside title page lists the preparer as *Amec Foster Wheeler Environment & Infrastructure, Inc.*
2 Page iii, *List of Appendices*. Please correct the spelling of table in the Appendix L title.
3 Page 1-2, Section 1.2 *Conceptual Site Model*, lines 178-179. Please clarify the Cobble Zone (CZ) saturation. The line 178 text indicates …*CZ is partially saturated*…, while line 179 ends with …*much of the CZ is saturated.*
4 Page 1-3, Section 1.3.1 *SVE Remedy*, line 230. Please edit the sentence to read, "removed *approximately* 344,000 gallons of fuel contamination."
5 Page 1-3, Section 1.3.1 *SVE Remedy*, lines 236-237. Please identify the four nested vapor monitoring points that were abandoned in 2013. Will these monitoring points be replaced to provide data for evaluating the performance of the SVE system?
6 Page 1-4, Section 1.3.1 *SVE Remedy*, line 243. Please add a brief paragraph summarizing any efforts assessing contaminant vapor intrusion into buildings on or near the site.
7 Page 1-4, Section 1.3.2 *SEE and EBR Remedy*, line 273. Please replace "the USEPA" with "EPA."
8 Page 1-4, Section 1.3.2 *SEE and EBR Remedy*, line 276. Please replace "USEPA" with "EPA."
9 Page 1-5, Section 1.3.2 *SEE and EBR Remedy*, line 279. Please edit to read … "construction, completion, and extraction startup in the second quarter of 2018, but *sulfate* injection was …"
10 Page 1-7, Section 1.5 *Report Objectives*, line 302. Please edit to read "… OM&M report with respect to the *EBR* pilot study *and other site activities for* …"
11 Page 2-1, Section 2.1.1 *General SVE System Operation*, lines 341-346. Please edit the sentences for clarity.
12 Page 2-2, Section 2.1.1 *General SVE System Operation*, lines 346. The sentence states the thermal oxidizer treated air stripper off-gas through the end of the 2018 reporting period; however, Section 3.1.2 states on lines 985-987 that the blower motor failed and the thermal oxidizer went down and remained out of service through the end of the 2018 reporting period. Please reconcile these statements.
13 Page 2-5, Section 2.1.2 *SVE System Monitoring*, line 407. Please edit "were monitored" to read "was monitored."
14 Page 2-10, Section 2.2.1.1 *SVE Vapor Sample Analysis*, lines 523-526. The description of decreases in VOC concentrations at 10 of 15 wells is not clear based on the data provided in Table 2-6. Thirteen wells are listed in the sentence. What is the basis for the comparison? What dates are compared?
15 Page 2-10, Section 2.2.1.1 *SVE Vapor Sample Analysis*, lines 526-528. The description of an increase in VOC concentrations at ST012-SVE05D is not clear based on the data provided in Table 2-6. Table 2-6 indicates a decrease in the VOC concentrations at this location. Please clarify.
16 Page 2-18, Section 2.2.1.2 *SVE Process Monitoring*, line 610. Please delete "date" from the text.
17 Page 2-18, Section 2.2.1.2 *SVE Process Monitoring*, lines 614-615. Why was the total flow rate from the wellfield not measured at the manifold?
18 Page 2-18, Section 2.2.1.2 *SVE Process Monitoring*, lines 667, 670. The reported maximum flows for ST012-SVE12 and ST012-SVE14 are not credible. Flow through a 2-inch PVC blank casing with 75-

foot length (i.e., depth to top of screen) at these rates results in a frictional pressure drop of about 60 inH_2O. This pressure drop is higher than the maximum reported wellhead vacuum indicating an error in the reading. Please check these readings.

19 Page 2-29, Section 2.3.1 *Mass Removal and Destruction Efficiency*, line 741-742. Please add the lack of flame oxidizer sampling in the third quarter to the list of deviations in Section 2.2.3.

20 Page 2-31, Section 2.3.1 *Mass Removal and Destruction Efficiency*, line 772-774 [*Also please refer to the illustrative figure following this comment.*]. The text states that prior to SEE, CH4 concentrations in the vapor collected by SVE were much lower and that the collection of CH4 by SVE appears related to SEE and suggests that the CH4 is likely generated in the saturated zones. However, methane was monitored in the SVE manifold from early 2008 through at least mid-2009 and similar rates were observed at that time as indicated in the graph below (Comment Figure 1) from an historical ST012 SVE progress report. Consider editing the text to state that anaerobic degradation has been observed throughout the SVE operations; however, delineating the locations of degradation between the saturated zone and the vadose zone is difficult. In addition, increased temperature within limits is known to increase anaerobic degradation rates such that the TEE and SEE efforts both impacted the rates but quantification of the impact is not possible with the available data.



Comment Figure 1

21 Page 2-31, Section 2.3.1 *Mass Removal and Destruction Efficiency,* and Graph 2-2, line 775. What were the causes for the inflection at the start of May 2016 toward an increase in methane recovery? Can this be attributed to the re-connection of deep SVE well screens?

22 Page 2-32, Section 2.3.2, lines 795-797. The text states TPH concentrations at ST012-SVE05D, ST012-SVE06D, and ST012-SVE07M began increasing in August/September 2011 to levels consistent with startup concentrations at these locations. What are possible explanations for this observation? Did the water table rise to the bottom of these screens by 2011?

23 Page 2-32, Section 2.3.2 *Notable Trends*, line 817. The text states the TPH measurement in April 2005 was made at the thermal oxidizer influent, is this correct? Or was the measure from the flame oxidizer influent?

24 Page 2-32, Section 2.3.2 *Notable Trends*, lines 816-817. The text states the TPH influent concentration was decreased in December 2016 from April 2005. Were similar wells connected to the SVE system at these two times to make the comparison relevant? Should the text read, "…December 2016 after the cessation of *SEE and more than six months after re-connecting and extraction from the deep SVE wells*"?

25 Page 2-32, Section 2.3.2 *Notable Trends*, line 820. Please correct the spelling of concentration.

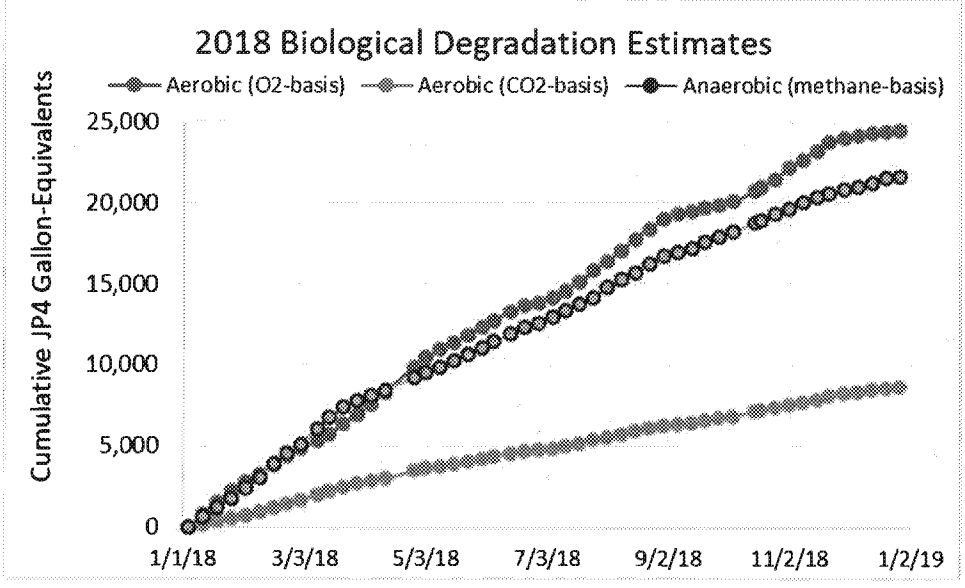
26 Page 2-27, Section 2.3.2 *Notable Trends*, line 820. Please edit to read, "… from *the* thermal oxidizer."

27 Page 2-27, Section 2.3.2 *Notable Trends*, line 822. Please edit to read, "… from *the* flame oxidizer."

28 Page 2-33, Section 2.3.2 *Notable Trends*, lines 839-841. The text states deep SVE well concentrations were higher after SEE but overall TPH concentrations were lower; should this refer to a lower influent TPH concentration rather than overall concentrations? Was the lower influent TPH concentration also attributable to relatively low extraction rates from the deep screens as compared to the middle screens? If extraction were terminated in the deep SVE wells, would concentrations be expected to rise in the middle well screens providing an increase in mass removal rate? Were the total extraction rates equivalent for the periods being compared?

29 Page 2-33, Section 2.3.2 *Notable Trends*, line 858. Should the sentence refer to increases in CO2 rather than CO?

30 Page 2-33, Section 2.3.2 *Notable Trends*, line 863 [*Also please refer to the illustrative figure following this comment.*]. Please provide some discussion on the estimated magnitude of aerobic degradation occurring based on oxygen depletion and carbon dioxide production. For example, using field measures at the wellfield influent for flow rate, oxygen content, and carbon dioxide content (provided in Appendix B), the rate of hydrocarbon degradation averaged 450 pounds per day based on oxygen depletion and 160 pounds per day based on carbon dioxide production. Using these rates, the estimated volume of fuel hydrocarbons degraded by aerobic processes reported in the 2018 period ranges from 8,700 to 24,500 gallon-equivalents. Similar calculations for methane yield a 2018 total anaerobic degradation of 21,600 gallon-equivalents as illustrated below (Comment Figure 2). The anaerobic estimate appears to be higher than the value suggested by Graph 2-2 of the Annual Report (Page 2-31).



Comment Figure 2

31 Page 2-3, Section 2.3.3 *SVE Optimization Summary*, line 866. Please change "or" to "and."

32 Page 2-34, Section 2.3.3 *SVE Optimization Summary*, Graph 2-3. Please add wells SVE09M, 10, and 11 to the graph, as these wells were open to extraction during the reporting period.

33 Page 3-1, Section 3.1.1 *Groundwater Sampling*, lines 917-918. Please clarify in the text that Table 3-1 does not include the November 2018 Annual sampling results, which are discussed in Appendix O.

34 Page 3-1, Section 3.1.1 *Groundwater Sampling*, line 922. Please add a general discussion of the analytical results presented in Table 3-1.

35 Pages 3-2 through 3-9, Section 3.1.1 *Groundwater Sampling*, Table 3-1. Please repair column headings.

36 Page 3-3, Section 3.1.1 *Groundwater Sampling*, Table 3-1. Please place the well CZ23 results in chronological order.

37 Page 3-10, Section 3.1.2 *Groundwater Extraction and Treatment Activities*, line 961. Please add a general discussion of the analytical results presented in Table 3-2.

38 Page 3-10, Section 3.1.2 *Groundwater Extraction and Treatment Activities*, line 969. Please add a table presenting the data for extraction rates and cumulative volume extracted used to create Graph 3-1 or add the data to Appendix I with the flow readings for the individual extraction wells and state where the total flow reading was made.

39 Page 3-10, Section 3.1.2 *Groundwater Extraction and Treatment Activities*, line 969. Please add a graph showing the mass removal estimates for benzene and TPH by the groundwater extraction system and provide a brief discussion.

40 Page 3-11 through 3-14, Section 3.1.2 *Groundwater Extraction and Treatment Activities*, Table 3-2. Please add a heading on each page identifying the table as Table 3-2.

41 Page 3-22, Section 3.1.5 *Site Temperature Monitoring*, lines 1050-1051; AND Page 3-30, Section 3.4.4.1 *Wastewater Discharge Permit Compliance*. Please correct the following inconsistency and clarify waste disposal activities conducted during the reporting period. Text on page 3-22, Section 3.1.5 *Site Temperature Monitoring*, lines 1050-1051 states that ten of the eleven temperature monitoring points had temperatures above the maximum value of 150° F approved for disposal in the City of Mesa sewer. Section 3.4.4.1 states wastewater was discharged to the City of Mesa according to the approved permit, and further states that the maximum discharge temperature was not exceeded.

42 Page 3-29, Section 3.4.2 *Annual Groundwater Monitoring*, lines 1180-1183. How was TPH mass removed calculated? The table provided on page 3-11 indicates only one air stripper influent sample was analyzed for TPH.

43 Page 3-29, Section 3.4.2 *Annual Groundwater Monitoring*, lines 1183-1184 [*Also please refer to the figure following this comment.*]. The text states estimated cumulative mass removals for benzene and TPH were 123 lbs. and 1,854 lbs. from startup through 28 November 2018, respectively. This estimate appears to be based on widely varying measures of total groundwater extraction rate and monthly sampling. An equivalent method for estimating these masses is available from the more frequently collected data in the air stream entering the thermal oxidizer (and exiting the air stripper). The report states that the thermal oxidizer was dedicated to treating the air stripper off-gas from 04 May 2018 through December 13, 2018. Air flow and VOC concentrations are available for the thermal oxidizer influent providing independent data for calculating the mass of benzene and TPH removed from the air stripper influent water (extracted groundwater). Estimates of the masses stripped from the water and into the thermal oxidizer influent are provided below (Comment Figure 3) using the flow and concentration data. The cumulative benzene mass estimate is significantly higher than 123 pounds and the TPH mass is much higher than the reported 1,854 pounds. Please discuss these discrepancies and state which is considered more reliable.

Groundwater Mass Extracted from ThermOx Treatment of Air Stripper Off-Gas

DATE	Air Flow	Benzene	Benzene	Benzene	TPH	TPH	TPH
5/4/2018	scfm	ppm	lb/day	cum. lbs	ppm	lb/day	cum. lbs
5/17/2018	989	7.6	2.36	31	90	37.9	493
5/31/2018	922	14	4.05	75	120	47.1	1,088
6/28/2018	605	7.4	1.40	152	110	28.4	2,145
7/12/2018	430	0.37	0.05	162	40	7.3	2,395
7/26/2018	387	9.3	1.13	170	90	14.8	2,550
8/9/2018	387	16	1.94	192	150	24.7	2,827
8/23/2018	386	17	2.06	220	180	29.6	3,207
9/6/2018	605	19	3.60	259	300	77.3	3,956
9/20/2018	616	17	3.28	307	200	52.5	4,864
10/4/2018	610	10	1.91	344	150	39.0	5,505
10/18/2018	614	12	2.31	373	110	28.8	5,979
10/23/2018	609	7	1.34	382	70	18.2	6,096
11/1/2018	621	7.7	1.50	395	80	21.2	6,273
11/15/2018	441	0.018	0.00	406	0	0.0	6,422

Comment Figure 3

44 Figures 3-1 through 3-3 are unreadable in the electronic version of the draft report. Please ensure this is corrected for the final report.

45 Figure 3-4. The 5 µg/L contour line should be dashed between wells CZ24 and CZ25 on the east side of the site, and north-northwest of wells CZ07 and CZ08.

46 Figure 3-6. The 5 µg/L contour line should be dashed between wells W24 and LSZ55.

47 Appendix B *SVE Field Monitoring Results*, Page 10 of 73, "Now Air Stripper Influent." Are these readings taken in the air stream entering the air stripper to treat groundwater? If so, why are the field readings in December 2018 for the PID, FID, and other gases more closely aligned to readings for the SVE manifold than ambient air, as was observed in the May 2018 readings?

48 Appendix B *SVE Field Monitoring Results*, Page 13 of 73, "Thermal Oxidizer Influent." Are these readings equivalent to the air stripper effluent?

49 Appendix B *SVE Field Monitoring Results*. Field measurements for all the individual extraction screens SVE-01 Shallow through SVE-14 are incomplete and do not include measures for the current reporting period. Please add these data.

50 Appendix E *SVE Historical Hydrocarbon Concentration Data*. Please add a border to all inset graphs to avoid confusion as to which figure the plotted data belong.

51 Figure E-3. The inset graph has the same x-axis range as the larger graph; please reduce the date range on the inset graph for clarity.

52 Figure E-4. The inset graph should be deleted because the y-axis range is nearly the same as the larger graph.

53 Figure E-7. The inset graph does not appear to provide the same data as the larger graph or the y-axis range eliminates data. Please check or simply delete the inset graph.

Appendix O *Draft Annual 2018 Groundwater Monitoring Report, Former Liquid Fuels Storage Area, Site ST012, Former Williams Air Force Base, Mesa, Arizona;* prepared for AFCEC/CIBW, Lackland AFB, TX; prepared by Amec, Phoenix, AZ; document dated XX June, 2019 [*sic*] [*OR December 2019...ADEQ is unable to establish a report date due to multiple dates being attached to the title page and the page footers*].

APP O 1. Clarify the report date. The title page and the text footers have different dates.
APP O 2. Table of Contents. Titles for tables 3-1, 3-3, and 4-1 should be revised to reference 2018.
APP O 3. Several figures are identified in the respective legends as "Working Copy". Please ensure the final report includes final copies of figures.
APP O 4. Please cross-check all references cited in the text. For example, AMEC 2019a-e are cited in the text but are not listed in the Section 4.0 References.
APP O 5. Page 1-3, Section 1.1, line 168. Change 2017 to 2018 and check the reference.
APP O 6. Page 1-3, Section 1.1, line 179. Change 2017 to 2018 and check the reference.
APP O 7. Page 3-1, Section 3.1.1, line 396. Change CZ03 to C03.
APP O 8. Page 3-1, Section 3.1.1, line 397. Change W30 to W35.
APP O 9. Page 3-5, Section 3.3.2, line 538. Change 2017 to 2018.
APP O 10. Page 3-5, Section 3.3.2, lines 548-550. Add well W36 to the list and revise the figure references.
APP O 11. Page 3-6, Section 3.3.2.1, line 568. Change W30 to W37.
APP O 12. Page 3-6, Section 3.3.2.3, line 594. Change Figure 3-9 to Figure 3-8.
APP O 13. Page 3-6, Section 3.3.2.4, line 601. Please explain the relevance of well W29 results.
APP O 14. Page 3-11 and 3-12, Table 3-3. Please include the date 2018 in the table heading.
APP O 15. Page 3-13, Table 3-4. Please include wells UWBZ09, UWBZ18, LSZ33.
APP O 16. Page 3-14, Table 3-6. Please include wells UWBZ09, UWBZ18.
APP O 17. Page 3-14, Table 3-7. Please include well UWBZ18.
APP O 18. Page 4-1, Section 4.1.1, line 693. Change 1195.40 to 1195.64.
APP O 19. Page 4-1, Section 4.1.1, line 718-719. Please state the number of gallons removed from each zone (CZ, UWBZ, and LSZ).
APP O 20. Page 4-2, Section 4.1.2.1, line 739. Change November 2017 to November 2018.
APP O 21. Please add figures showing benzene contours in the CZ and UWBZ. This section discusses the LSZ benzene plume boundaries, but the supporting discussion includes benzene results in the CZ and UWBZ.
APP O 22. Figure 3-6d. Add naphthalene to the graph.
APP O 23. Add dashed contours between wells W24 and LSZ55 based on results from soil boring SB18.

Closure

ADEQ may add or amend comments, evaluations, and concurrence if evidence to the contrary of our understanding is discovered; if received information is determined to be inaccurate; if any condition was unknown to ADEQ at the time this document was delivered; if other parties bring valid concerns to our attention; or site conditions are deemed not protective of human health and the environment within the scope of this Department.

Thank you for the opportunity to comment. Should you have any questions regarding this correspondence, please contact me by phone at (602) 771-4121 or e-mail miller.wayne@azdeq.gov.

Sincerely,

Wayne Miller
ADEQ Project Manager, Federal Projects Unit
Remedial Projects Section, Waste Programs Division

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